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BROWDY AND NEIMARK, P.L.L.C.
ATTORNEYS AT LAW
PATENT AND TRADEMARK CAUSES
SUITE 300
624 NINTH STREET, N.W.
WASHINGTON, D.C. 20001-5303
TELEPHONE (202)-628-5197

TELECOPIER FACSIMILE
(202) 737-3528
(202) 393-1012

E MAIL
mail@browdyneimark.com

PATENT AGENT
ALLEN C. YUN, PH.D.

ALVIN BROWDY (1917-1998)
SHERIDAN NEIMARK
ROGER L. BROWDY

ANNE M. KORNBAU
NORMAN J. LATKER
ROBERT M. DEWITTY*
(*MD BAR ONLY)

OF COUNSEL
IVER P. COOPER
JAY M. FINKELSTEIN

November 1, 2000

Hon. Commissioner for Patents
Box Patent Appln
Washington, D.C. 20231

Re: New Patent Application in U.S.
Applicant: Klaus BRANDSTÄTTER 4
Title: OPERATING METHOD FOR CONTROLLING LOAD-BALANCED...
Atty's Docket: BRANDSTATTER 4

Sir:

Attached herewith is the above-identified application for Letters Patent including:

[X] Specification (8 pages), claims (3 pages) and abstract (1 page)
[X] 7 Sheet Drawings (Figures 1-7)
[X] Formal [ ] Informal
[X] Declaration and Power of Attorney (2 pages)
[X] Newly executed [ ] Copy from prior application no. ___
[ ] Preliminary Amendment
[ ] Computer-readable Sequence Listing
[ ] Supplemental Preliminary Amendment adding new claims -
[ ] Information Disclosure Statement with 1449 and references
[X] Applicant claims small entity status (A copy of the statement is attached). See 37 CFR 1.27.
[X] Please charge my American Express Account, Form PTO-2038 attached in the amount of $ 355.00 to cover:
[X] The filing fee calculated as follows (including any preliminary amendment for entry prior to calculation of the filing fee):

CLAIMS AS FILED				
FOR	NUMBER FILED	NUMBER EXTRA	RATE	BASIC FEE $ 710.00
TOTAL CLAIMS	8 - 20	= 0	x 18	--0
INDEPENDENT CLAIMS	1 - 3	= 0	x 80	--0
[ ] Multiple Dependent Claim Presented			+ 270	--
[X]Reduction of 1/2 for Small Entity				$ 355.00
TOTAL FILING FEE				$ 355.00

[ ] Any additional fee required by the filing of an enclosed preliminary or supplemental preliminary amendment (for entry after calculation of the filing fee) has been calculated as shown below:

	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NO. PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE	CALCULATION
TOTAL		-	=	x 18	
INDEP.		-	=	x 78	
[ ] Multiple Dependent Claim Presented				+ 260	
[ ] Reduction by 1/2 for Small Entity					
Total Additional Fee =					

[ ] Other Fees: _____.
[ ] Other Attachments: _____.
[X] Return Receipt Postcard (in duplicate)

The following statements are applicable:

[ ] The benefit under 35 USC §119 is claimed of the filing date of: Application No._____ in _____ on_____. A certified copy of said priority document [ ] is attached [ ] was filed in progenitor case _____ on _____.

[ ] The present application is a Continuation Divisional Continuation-in-part of prior claims the benefit of U.S. Provisional application no. , filed .

[ ] Incorporation By Reference. The entire disclosure of the prior application, from which a copy of the oath or declaration is supplied herewith, is considered as being part of the disclosure of the accompanying application and is hereby incorporated by reference therein.

[ ] A signed statement deleting inventor(s) named in the prior application is attached.

[ ] The prior application was assigned to: _____

[ ] Amend the specification by inserting before the first line the sentence:
--This is a continuation/division/continuation-in-part claims the benefit of U.S. Provisional of copending parent application Serial No. , filed .--

[ ] Certain documents were previously cited or submitted to the Patent and Trademark Office in the following prior application _____, which is relied upon under 35 USC §120. Applicants identify these documents by attaching hereto a form PTO-1449 listing these documents, and request that they be considered and made of record in accordance with 37 CFR §1.98(d). Per Section 1.98(d), copies of these documents need not be filed in this application.

[ ] A verified statement claiming small entity status is enclosed in progenitor application no. , filed . Status is still proper and desired.

[ ] The undersigned attorney of record hereby revokes the powers of attorney of:

[ ] The undersigned attorney of record hereby appoints associate power of attorney, to prosecute this application and to transact all business in the Patent and Trademark Office in connection therewith to:

[X] The Commissioner is hereby authorized to charge payment of the following additional fees associated with this communication or credit any overpayments to Deposit Account No. 02-4035:
[X] Any additional filing fees required under 37 CFR §1.16.
[X] Any patent application processing fees under 37 CFR §1.17.

[X] The Commissioner is hereby authorized to charge payment of the following fees, based on any paper filed during the pendency of this application or any CPA thereof, to effect any amendment, petition, or other action requested in said paper or credit any overpayments to Deposit Account
No. 02-4035:
[X] Any patent application processing fees under 37 CFR §1.17.
[ ] The issue fee set in 37 CFR §1.18 at or before mailing the Notice of Allowance, pursuant to 37 CFR §1.311(b).
[X] Any filing fees under 37 CFR §1.16 for presentation of extra claims.
[X] If a paper is untimely filed in this or any CPA thereof by Applicant(s), the Commissioner is hereby petitioned under 37 CFR. §1.136(a) for the minimum extension of time required to make said paper timely. In the event a petition for extension of time is made under the provisions of this paragraph, the Commissioner is hereby requested to charge any fee required under 37 CFR §1.17 to Deposit Account 02-4035.

[X] The Commissioner is hereby authorized to credit any overpayment of fees accompanying this paper to Deposit Account No. 02-4035.

Respectfully submitted,
BROWDY AND NEIMARK, P.L.L.C.

By: _____
Sheridan Neimark
Registration No. 20,520

SN:wrd

Applicant or Patentee: Klaus BRANDSTÄTTER Attorney's
Serial or Patent No.: _____ Docket No.: _____
Filed or Issued: _____
For: _____

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 CFR 1.9 (f) and 1.27 (c)) — SMALL BUSINESS CONCERN

I hereby declare that I am

[X] the owner of the small business concern identified below:

[ ] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN HOB electronic GmbH & Co. KG
ADDRESS OF CONCERN Brandstätterstrasse 2-10
D-90513 Zirndorf - Germany

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9 (d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled Operating Method for Controlling Load-Balanced Access by user Computers to Server Computers in a Computer Network by inventor(s) Klaus BRANDSTÄTTER described in

[X] the specification filed herewith
[ ] application serial no. _____, filed _____.
[ ] patent no. _____, issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9 (d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9 (d) or a nonprofit organization under 37 CFR 1.9 (e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME _____
ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

NAME _____
ADDRESS _____
[ ] INDIVIDUAL [ ] SMALL BUSINESS CONCERN [ ] NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28 (b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Klaus BRANDSTÄTTER
TITLE OF PERSON OTHER THAN OWNER Presdient
ADDRESS OF PERSON SIGNING Hasensprung 16, D-90574 Rosstal - Germany

SIGNATURE _____ DATE Sept 24th 2002

Operating Method for Controlling Load-Balanced Access by User Computers to Server Computers in a Computer Network

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a data processing program based operating method for computer networks for controlling load-balanced access by a user computer to a server computer in a computer network with multiple user and server computers.

Background Art

A general problem with computer networks that incorporate multiple user and server computers consists of assigning to the individual user computers in the most optimized manner a server computer that has sufficient capacities, i.e., the lowest possible load. In the state of the art, this problem has, until now, essentially been solved in such a way that one of the servers registers the calls coming from the network of user computers for programs installed on all servers, and performs an allocation between a certain server computer and the user computer. The criterion for these allocations is the desire to balance the load of all connected server computers as evenly as possible.

However, the server computer that has been given prominence in the hierarchy over the remaining server computers, which assumes the access control and is commonly referred to as the load-balancing server, has the

problem that load-balanced access by the individual user computers to certain server computers is no longer possible if this computer fails.

SUMMARY OF THE INVENTION

Against the background of the described problem, the invention is based on the aim of revealing an operating method for computer networks that ensures load-balanced access by a user computer to one of multiple server computers without the need for a privileged load-balancing server.

This aim is met by an operating method comprising the following steps:

- all server computers continually determine a load on their central processing unit – CPU load – and store at least one load-specific data value in a configuration that can be called up over the computer network,
- all server computers wait for datagrams stemming from user computers in the network, which incorporate a header to call up load-specific data values,
- a user computer seeking access to the server computer with the lowest CPU load sends a datagram over the network to the server computers, with a header to call up the CPU load,
- the server computers each send back a reply datagram over the network to the user computer with the load-specific data value,
- the user computer analyzes the datagrams to determine which server computer has the lowest CPU load, and
- access is initiated to the server with the lowest CPU load.

Recognizably, access is thus equal to all server computers and each of them determines its own load. Information regarding this load is processed by a

user computer seeking access, after which the user computer itself selects "its" server computer with the lowest load.

Recognizably, there is no longer a load-balancing server, the failure of which could impede the load-balanced access. The optimally balanced load of the server computers that are connected to the network is thus ensured in a significantly more fail-safe manner.

Preferred embodiments of the inventive operating method, the specific characteristics and advantages of which will become apparent from the following description, in which the invention is explained in greater detail based on the appended drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figs. 1 through 3 show schematic diagrams for a method of controlling the access of a user computer to a server computer in a computer network in successive phases, and

Figs. 4 through 7 show corresponding diagrams for an alternate operating method.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

An operating method according to the invention is implemented on the various computers in the computer network 1 shown in Figs. 1 through 7 on the basis of a corresponding data processing program. The program is installed, in the usual manner, with its corresponding program components on

the user computers U1 through U5 on one hand, and on the server computers S1 - S5 on the other hand. It is commonly started on the server as a service. Alternately, it may also be started from the "command prompt", from the console. When the program is called up, the number of a UDP (= USER DATAGRAM PROTOCOL) port may be transmitted. If no port number is transmitted, a default port, e.g., default port 4095, is used.

Based on the program, all server computers now continually determine the load on their central processing units. This CPU load is determined on the basis of the amount of time that has elapsed since the last time the respective central processing unit was called, and a corresponding load-specific data value is determined. When multiple central processing units exist in a server computer, the average of all active processors is formed. The inventive program then stores these determined values in a defined number of 20 entries of elapsed amounts of time in a table, from which a data value is determined that is specific for the CPU load.

In this condition all server computers S1 through S5 wait for datagrams arriving from the user computers U1 through U5, while the load-specific data value is continually updated.

If access is now to take place by a user computer U3 from the total number of user computers U1 through U5 to initiate a program session on the server computer S1 through S5 with the lowest load, a circular datagram is transmitted by the user computer U3 to all server computers S1 through S5 in the network 1. The datagram contains a header identifying the datagram as an instruction to call up the CPU load of the respective server computer S1 through S5 over the network 1. Instead of a circular datagram, individ-

ual datagrams may also be sent to predefined server computers S1 through S5, which can be implemented based on the program configuration. The circular datagram is symbolized in Fig. 1 by the arrows 2.

Based on the circular datagram 2, all server computers S1 through S5 return reply datagrams 3.1 through 3.5 (see arrows in Fig. 2), in which a load-specific data value is transmitted over the network 1 to the user computer 3 via the UDP port 4095. This data value may be standardized to a range of 0 to 10,000, for example, with the value 10,000 corresponding to a 100% load. The reply datagrams 3.1 to 3.5 from the individual server computers S1 through S5 contain additional information regarding available connection ports, by which an exchange of data can take place between the user computer U3 and the respective server computer S1 through S5 according to the defined data exchange protocols. For example, the data exchange protocol RDP is available at all server computers S1 through S5. The server computers S1 and S5 additionally offer the ICA protocol. Lastly, data encryption is implemented on the server computers S1 through S3. The information relating to this is contained in the reply datagrams 3.1 through 3.5, as indicated in Fig. 2.

The user computer U3 now analyzes the datagrams 3.1 through 3.5 to determine which server computer has the lowest load under certain framework conditions, such as the desired data exchange protocol. If, for example, a connection is to be made via ICA, as a matter of principle only the server computers S1 and S5 are suitable. Of these two, the server computer S1 has a lower load with a CPU load of 2000, compared to the server computer S5 with a CPU load of 3000. The inventive operating method will,

therefore, establish a connection between the user computer U3 and the server computer S1, as indicated at 4.1 in Fig. 3.

However, if a connection between computers is to be made via the RDP protocol, all server computers are available. Accordingly, the server computer S2 will be selected for the connection 4.2 since, with a CPU load of 500, it has the lowest load of all server computers S1 through S5.

To summarize, access will be initiated via the inventive access method to the server computer S1 or S2 that has the lowest CPU load while providing the desired data exchange protocol.

An alternate implementation of the inventive access method is symbolized in Figs. 4 through 7. To avoid unnecessary explanations, only the differences from the above-described method will be pointed out in this context. A circular datagram 5 is transmitted to the server computers S1 through S5 over the computer network 1 from the user computer U1 seeking access to the server computer with the lowest load, which, in addition to the above-mentioned header to call up the CPU load, also contains identification parameters representative for this computer, namely a user identification number "userID" and, optionally, also an associated domain name. If the received datagram 5 contains a userID, a determination is made with the aid of a corresponding API (application programming interface) in the server computer S1 through S5, whether program sessions with this user identification number are currently running. If a domain name is transmitted in addition to the user identification number, an additional check is performed when the user identification number matches, to determine whether the domain name matches.

On the server computers S1 through S5 it is now registered, in the usual manner, which program sessions are currently running in which condition. Distinctions are made, in this context, between the conditions "disconnected", "connected and active" and "other". The latter condition has no specific program-related definition.

If a circular datagram 5 with user ID and domain name is now transmitted, the server computers each send reply datagrams 6.1 through 6.5 which contain, in addition to the load-specific data value for the CPU load and the available transfer protocols, also a listing of the number of program sessions currently running for this user ID and domain name. For example, no program sessions of the user computer U1 are running on the server computers S1, S3, S5, which is manifested by the information "Sessions: 0/0/0".

On the server computer S2, two program sessions are disconnected and none are active, which is illustrated by the information "Sessions:2/0/0". The server computer S4 reports "Sessions:1/1/0", which means one disconnected and one connected, active program session.

The user computer U3 now analyzes the incoming reply datagrams 6.1 through 6.5 in such a way that it registers the respective CPU loads and the fact whether a disconnected program session exists on a server computer. In Fig. 6 this has been indicated by the table 7. In the process, the determination is made that a disconnected program session exists on the server computer S4 with the highest load of 50% of all server computers S1 through S5. The user computer U3 accordingly re-establishes this discon-

nected RDP program session with a corresponding connection 8 to the server computer S4 (see Figure 7).

What is claimed is:

1. A data processing program based operating method for computer networks to control load-balanced access by a user computer to a server computer in a computer network with multiple user and server computers having the following method steps:
   - all server computers (S1 - S5) continually determine the load of their central processing unit – CPU load – and store at least one load-specific data value in a configuration that can be called up over the computer network (1),
   - all server computers (S1 - S5) wait for datagrams (2, 5) stemming from user computers (U1 - U5) in the computer network (1), which incorporate a header to call up load-specific data values,
   - a user computer (U3) seeking access to the server computer (S1 - S5) with a lowest CPU load sends a datagram (2, 5) over the computer network (1) to the server computers (S1 - S5), with a header to call up the CPU load,
   - the server computers (S1 - S5) each send back a reply datagram (3.1 - 3.5; 6.1 - 6.5) over the computer network (1) to the user computer (U3) with the load-specific data value,
   - the user computer (U3) analyzes the reply datagrams (3.1 - 3.5; 6.1 - 6,5) to determine which server computer (S1 - S5) has the lowest CPU load, and
   - access is initiated to the server computer (S1, S2) with the lowest CPU load.

2. A method as set forth in claim 1, wherein the load-specific data value for the CPU load of a central processing unit of the respective server

computer (S1 - S5) is determined based on an amount of time that has elapsed since a last call on the central processing unit.

3. A method as set forth in claim 2, wherein the data value is determined from a defined number of entries of elapsed amounts of time into a table.

4. A method as set forth in claim 1, wherein the user computer (U3) seeking access sends a circular datagram (2, 5) to all server computers in the computer network (1).

5. A method as set forth in claim 1, wherein the user computer seeking access sends individual datagrams to pre-defined server computers.

6. A method as set forth in claim 1, wherein the user computer (U3) seeking access sends a user identification parameter that is representative for this computer, specifically a user identification number (userID) and an associated domain name, to the server computer (S1 - S5).

7. A method as set forth in claim 5, wherein the server computers (S1 - S5) transmit datagrams (6.1 - 6.5) with additional information on the active or interrupted program sessions for the user computer seeking access.

8. A method as set forth in claim 1, wherein the server computers (S1 - S5) transmit datagrams (3.1 - 3.5; 6.1 - 6.5) with information regarding

connection ports that are available under defined data exchange protocols (RDP; ICA).

Abstract

An operating method on the basis of a data processing program is designed to control load-balanced access by a user computer to a server computer in a computer network. The load-balanced access takes place based on an inquiry by the user computer to all server computers regarding their load, and according to an assignment to the server computer with the lowest load.

DOCKET 99980200

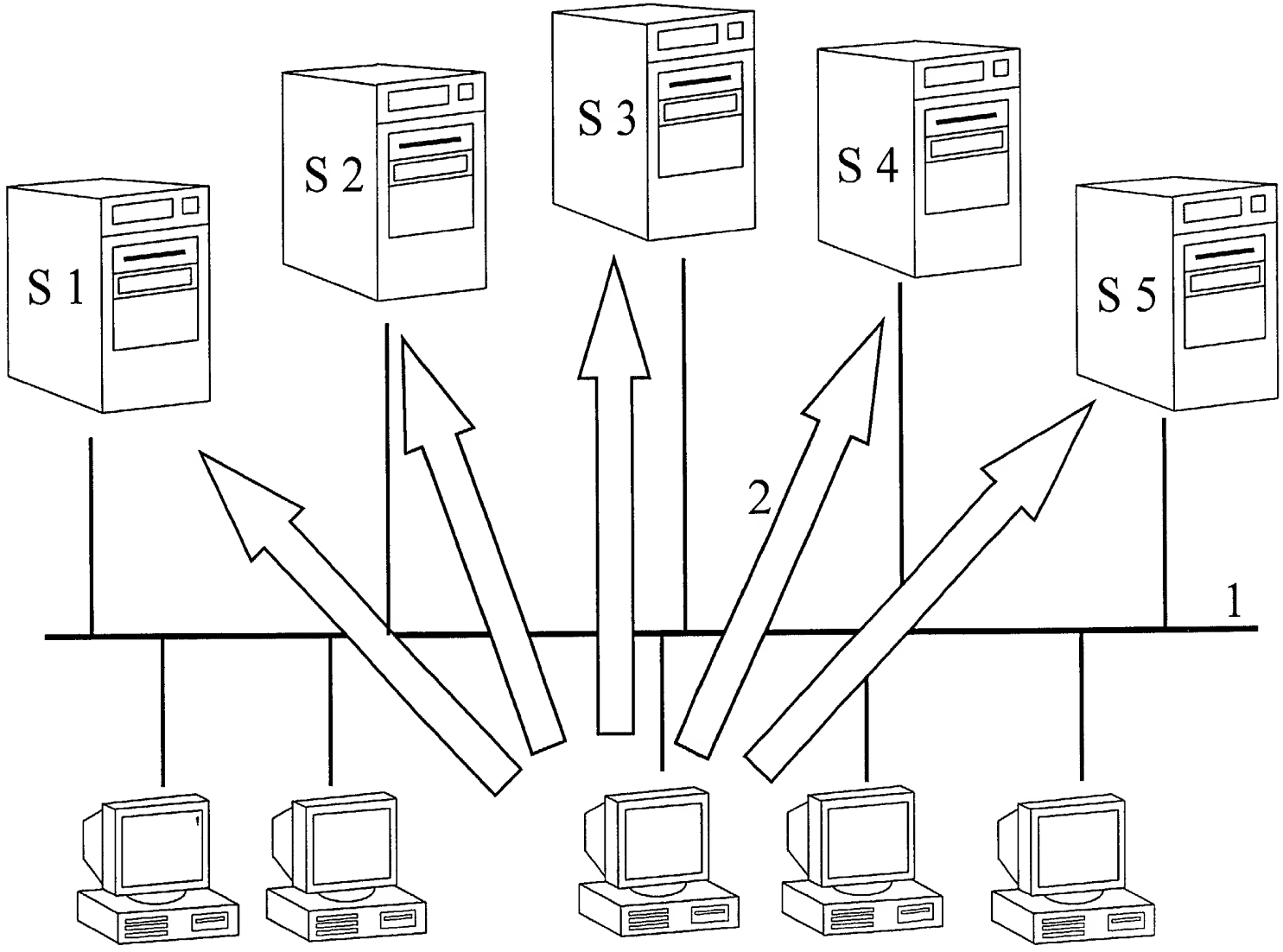

Fig. 1

DRAFT 20020260

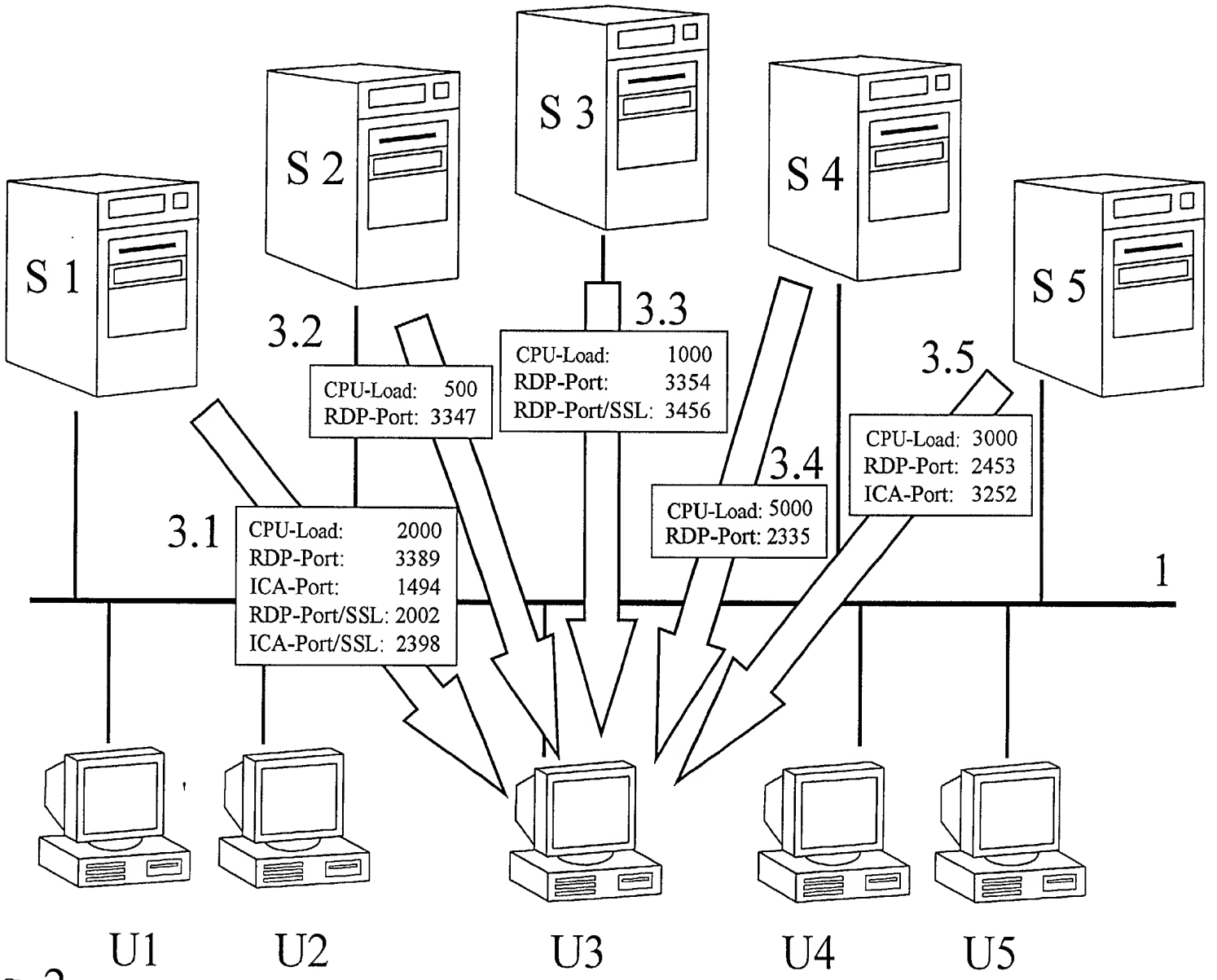

Fig. 2

DE10017999A1

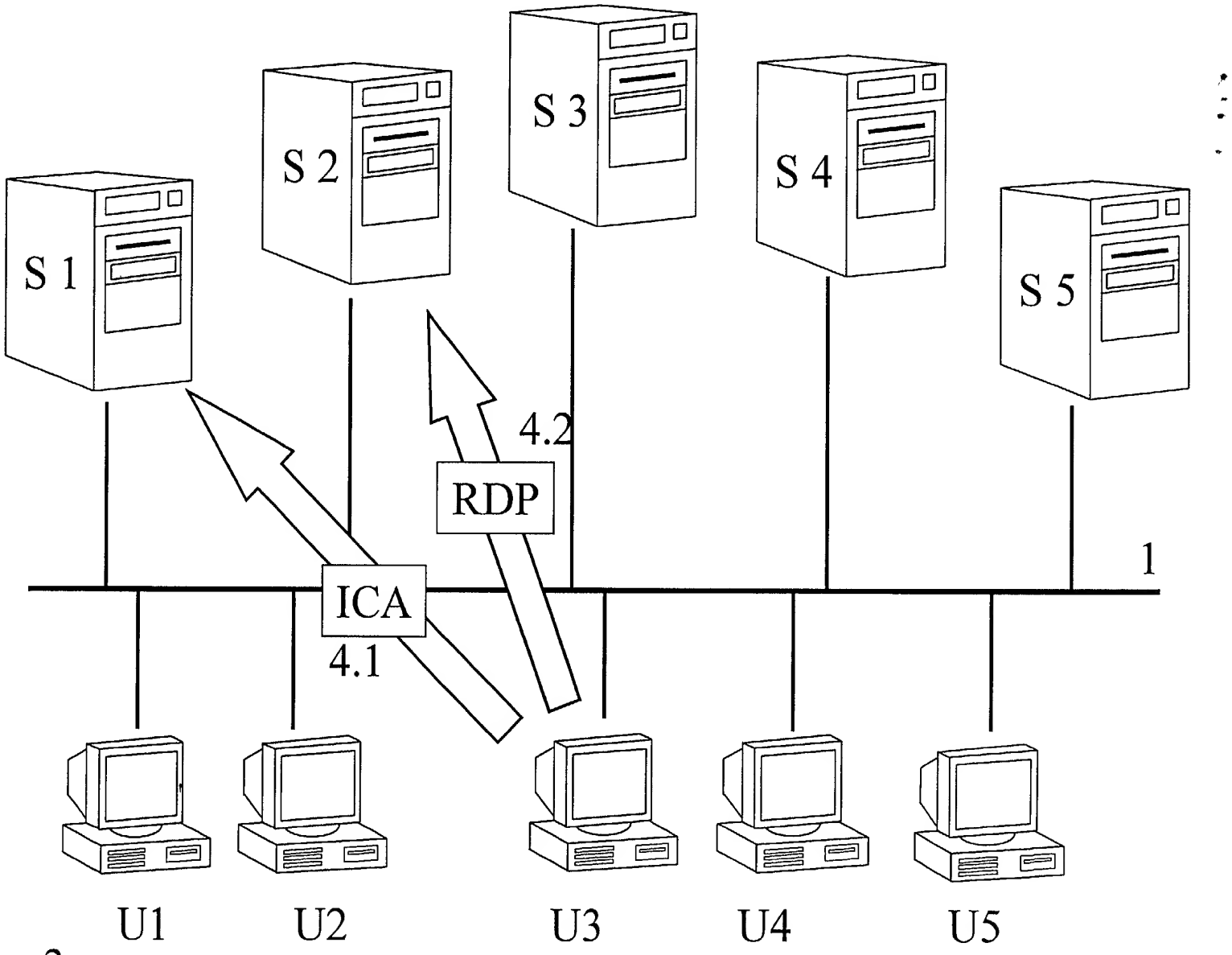

Fig. 3

DOCKET NUMBER

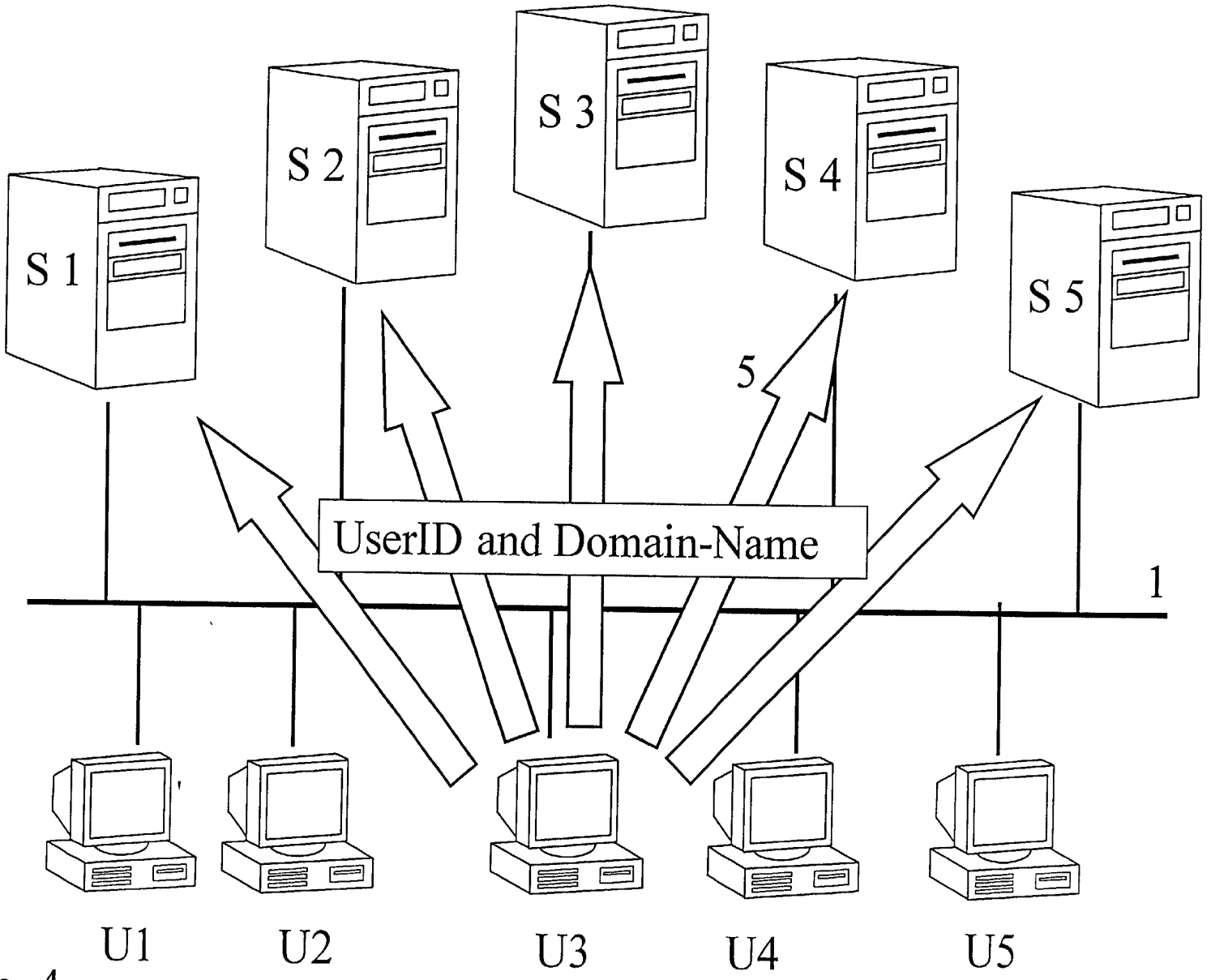

Fig. 4

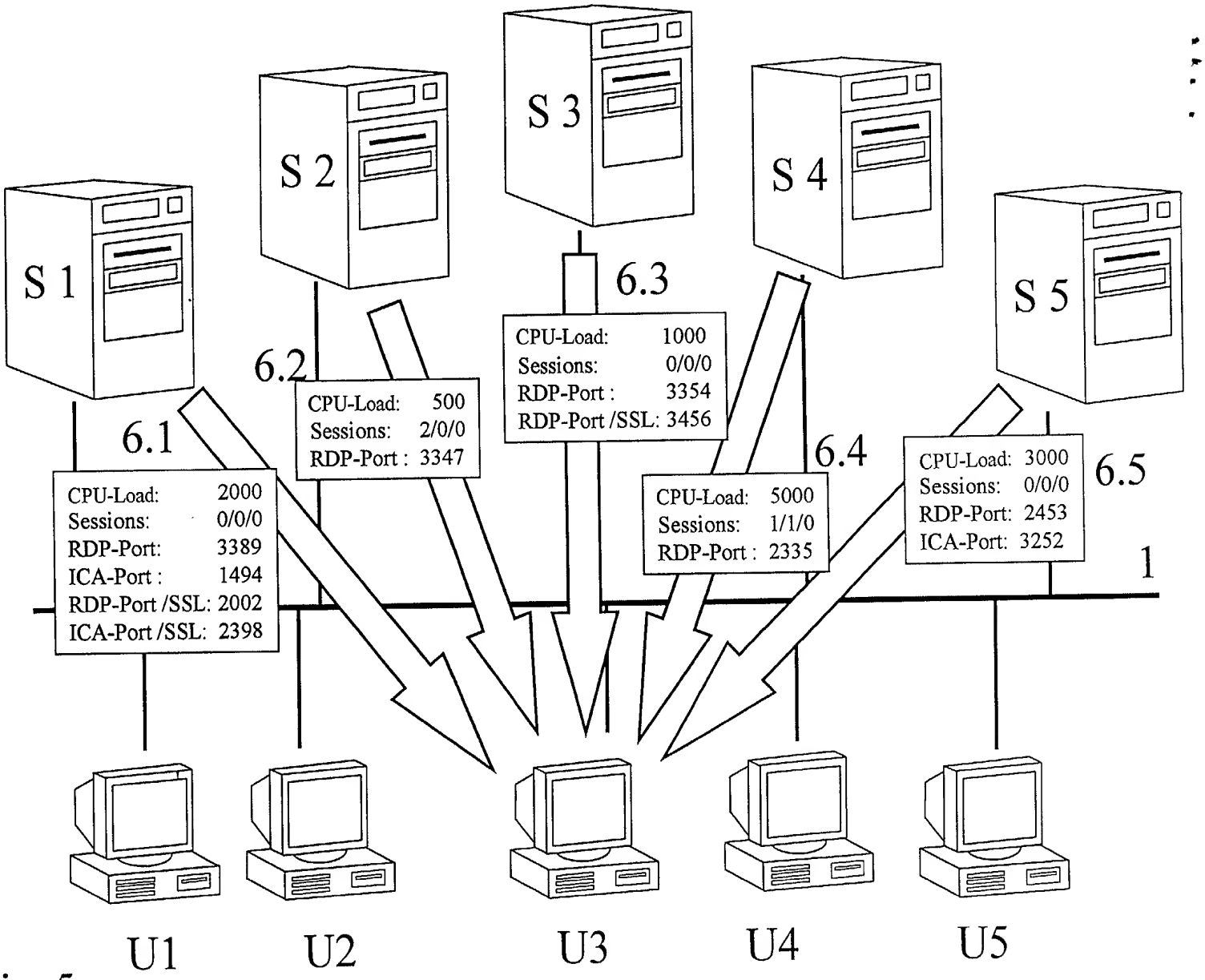
S 1
S 2
S 3
S 4
S 5
6.1
CPU-Load: 2000
Sessions: 0/0/0
RDP-Port: 3389
ICA-Port : 1494
RDP-Port /SSL: 2002
ICA-Port /SSL: 2398
6.2
CPU-Load: 500
Sessions: 2/0/0
RDP-Port : 3347
6.3
CPU-Load: 1000
Sessions: 0/0/0
RDP-Port : 3354
RDP-Port /SSL: 3456
6.4
CPU-Load: 5000
Sessions: 1/1/0
RDP-Port : 2335
6.5
CPU-Load: 3000
Sessions: 0/0/0
RDP-Port: 2453
ICA-Port: 3252
1
U1
U2
U3
U4
U5

Fig. 5

0010011 99920269

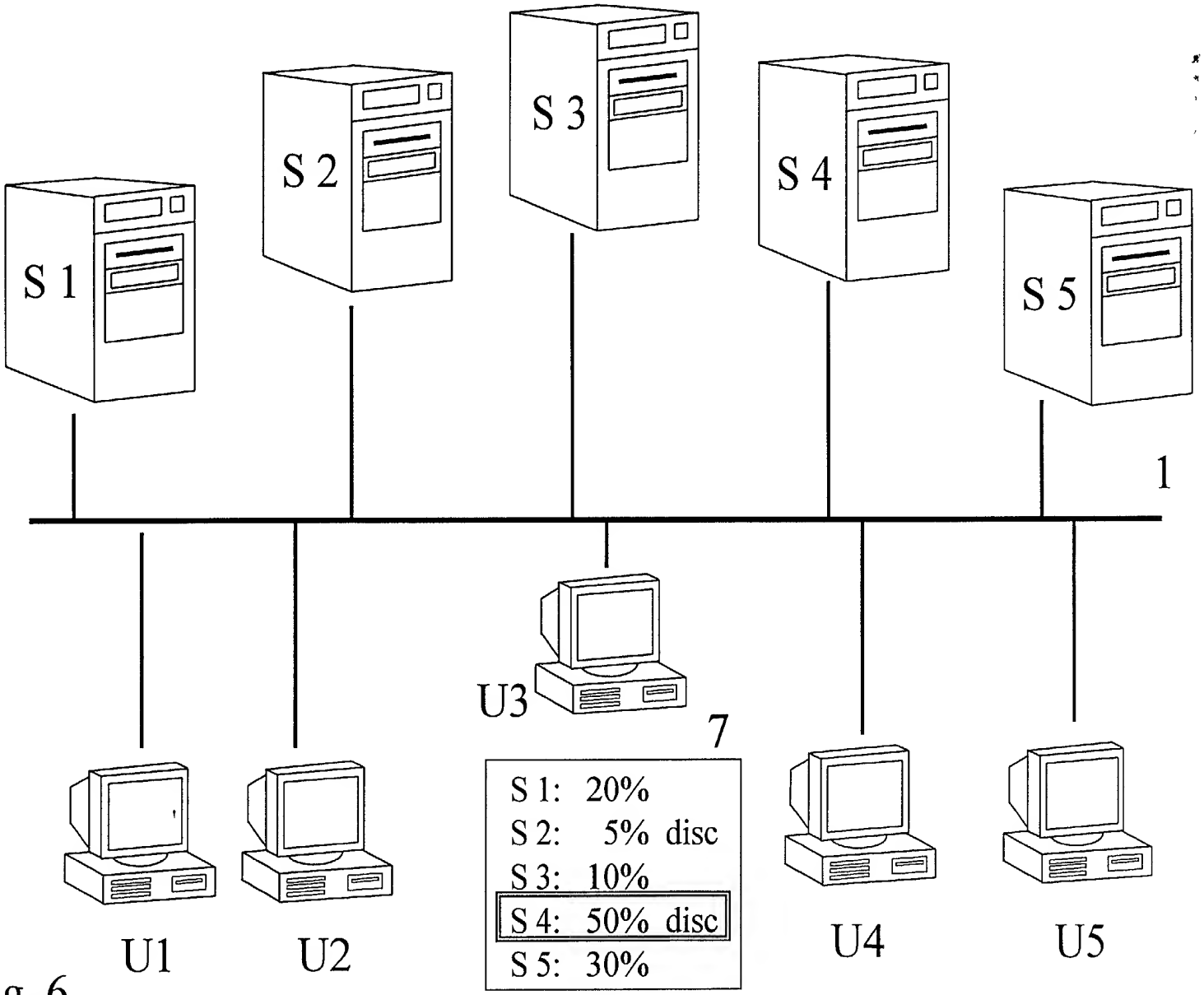

Fig. 6

0070FF 99980260

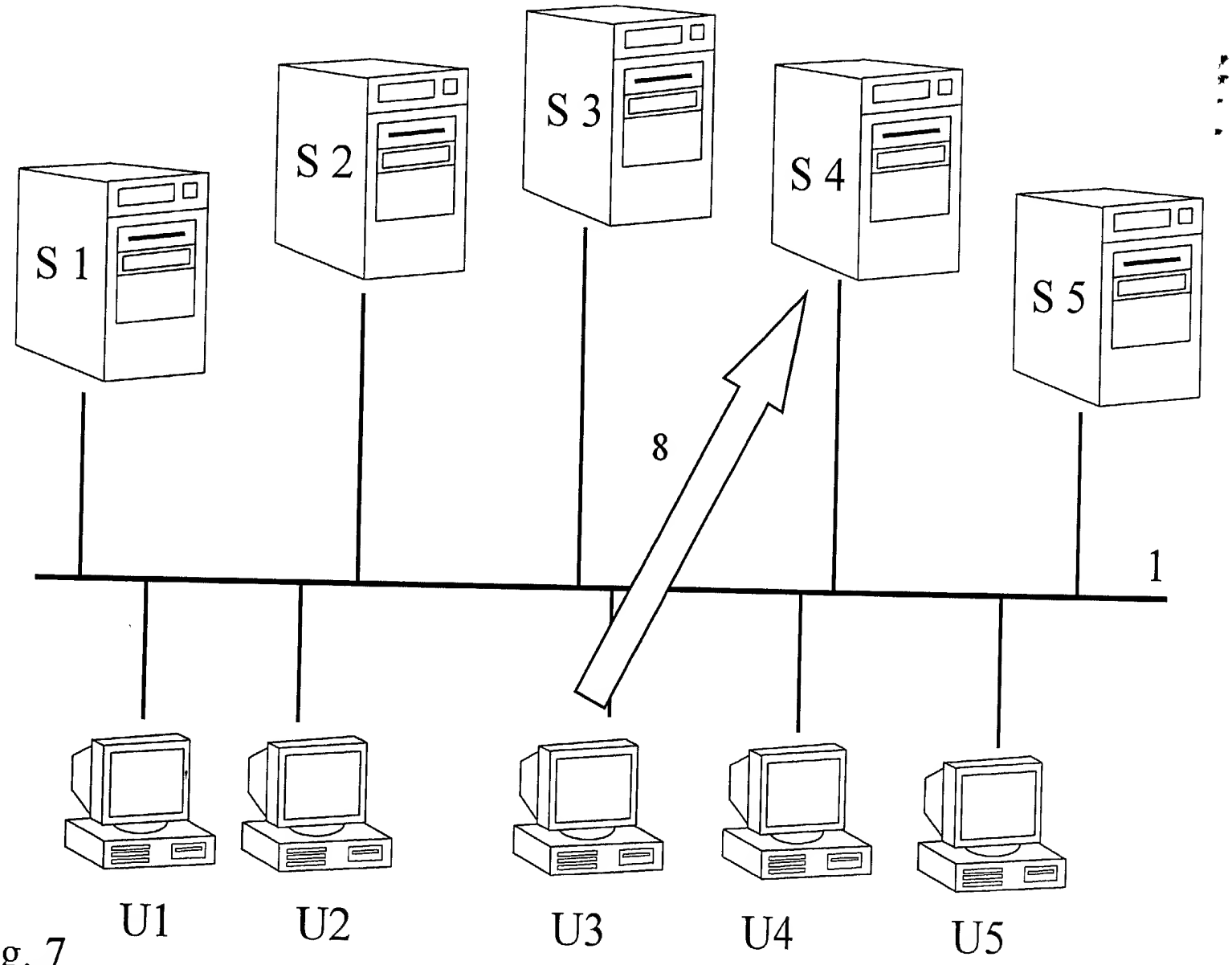

Fig. 7

Page 1 of 2 Pages [X] Original [ ] Substitute [ ] Supplemental Atty. Docket:

Combined Declaration for Patent Application and Power of Attorney

As a below-named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name; and that I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled Operating Method for Controlling Load-Balanced Access by User Computers to Server Computers in a

the specification of which (check one) Computer Network

[X] is attached hereto;
[ ] was filed in the United States under 35 U.S.C. §111 on _____, as U.S. Appln. No. _____*; or
[ ] was/will be filed in the U.S. under 35 U.S.C. §371 by entry into the U.S. national stage of an international (PCT) application, PCT/_____; filed _____, entry requested on _____*; national stage application received U.S. Appln. No. _____*; §371/§102(e) date _____* (* if known)

and was amended on _____ (if applicable).
(include dates of amendments under PCT Art. 19 and 34 if PCT)

I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above; and I acknowledge the duty to disclose to the Patent and Trademark Office (PTO) all information known by me to be material to patentability as defined in 37 C.F.R. §1.56.

I hereby claim foreign priority benefits under 35 U.S.C. §§ 119 and 365 of any prior foreign application(s) for patent or inventor's certificate, or prior PCT application(s) designating a country other than the U.S., listed below with the "Yes" box checked and have also identified below any such application having a filing date before that of the application on which priority is claimed:

(Number)	(Country)	(Day Month Year Filed)	[ ] YES	[ ] NO
(Number)	(Country)	(Day Month Year Filed)	[ ] YES	[ ] NO

I hereby claim the benefit under 35 U.S.C. §120 of any prior U.S. non-provisional application(s) or prior PCT application(s) designating the U.S. listed below, or under §119(e) of any prior U.S. provisional applications listed below, and, insofar as the subject matter of each of the claims of this application is not disclosed in such U.S. or PCT application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose to the PTO all information as defined in 37 C.F.R. §1.56(a) which occurred between the filing date of the prior application and the national filing date of this application:

(Application No.)	(Day Month Year Filed)	(Status: patented, pending, abandoned)
(Application No.)	(Day Month Year Filed)	(Status: patented, pending, abandoned)
(Application No.)	(Day Month Year Filed)	(Status: patented, pending, abandoned)

As a named inventor, I hereby appoint the following registered practitioners to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith:

All of the practitioners associated with Customer Number 001444

Direct all correspondence to the address associated with **Customer Number 001444**; i.e.,

BROWDY AND NEIMARK, P.L.L.C.
624 Ninth Street, N.W.
Washington, D.C. 20001-5303
(202) 628-5197

The undersigned hereby authorizes the U.S. Attorneys or Agents appointed herein to accept and follow instructions from _____ as to any action to be taken in the U.S. Patent and Trademark Office regarding this application without direct communication between the U.S. Attorneys or Agents and the undersigned. In the event of a change of the persons from whom instructions may be taken, the U.S. Attorneys or Agents appointed herein will be so notified by the undersigned.

Atty. Docket:

Title: _____

U.S. Application filed _____, Serial No. _____

PCT Application filed _____, Serial No. _____

I hereby further declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under 18 U.S.C. §1001 and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

FULL NAME OF FIRST INVENTOR	INVENTOR'S SIGNATURE	DATE
Klaus BRANDSTÄTTER		Sept 24th 2000
RESIDENT		CITIZENSHIP
Rosstal - Germany		German
POST OFFICE ADDRESS		
Hasensprung 16, D-90574 Rosstal - Germany		
FULL NAME OF SECOND JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF THIRD JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF FOURTH JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF FIFTH JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF SIXTH JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		
FULL NAME OF SEVENTH JOINT INVENTOR	INVENTOR'S SIGNATURE	DATE
RESIDENT		CITIZENSHIP
POST OFFICE ADDRESS		

ALL INVENTORS MUST REVIEW APPLICATION AND DECLARATION BEFORE SIGNING. ALL ALTERATIONS MUST BE INITIALED AND DATED BY ALL INVENTORS PRIOR TO EXECUTION. NO ALTERATIONS CAN BE MADE AFTER THE DECLARATION IS SIGNED. ALL PAGES OF DECLARATION MUST BE SEEN BY ALL INVENTORS.